

# Porous Pavement as a Stormwater Management Tool on Urban Streets

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2015 Purdue Road School  
March 12, 2015

# Agenda

- ❑ Benefits
- ❑ Sylvan Avenue
- ❑ Willard Street
- ❑ Maintenance
- ❑ Analysis
- ❑ Alternatives

# Benefits of Permeable Pavement

- ❑ Improve storm water management
- ❑ *Reduced downstream impacts*
- ❑ *Improved storm water quality*
- ❑ *Winter Conditions*
- ❑ *Noise*

# Agenda

- ❑ Benefits
- ❑ **Sylvan Avenue**
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# Sylvan Ave - Background

## Sylvan Ave Issues...

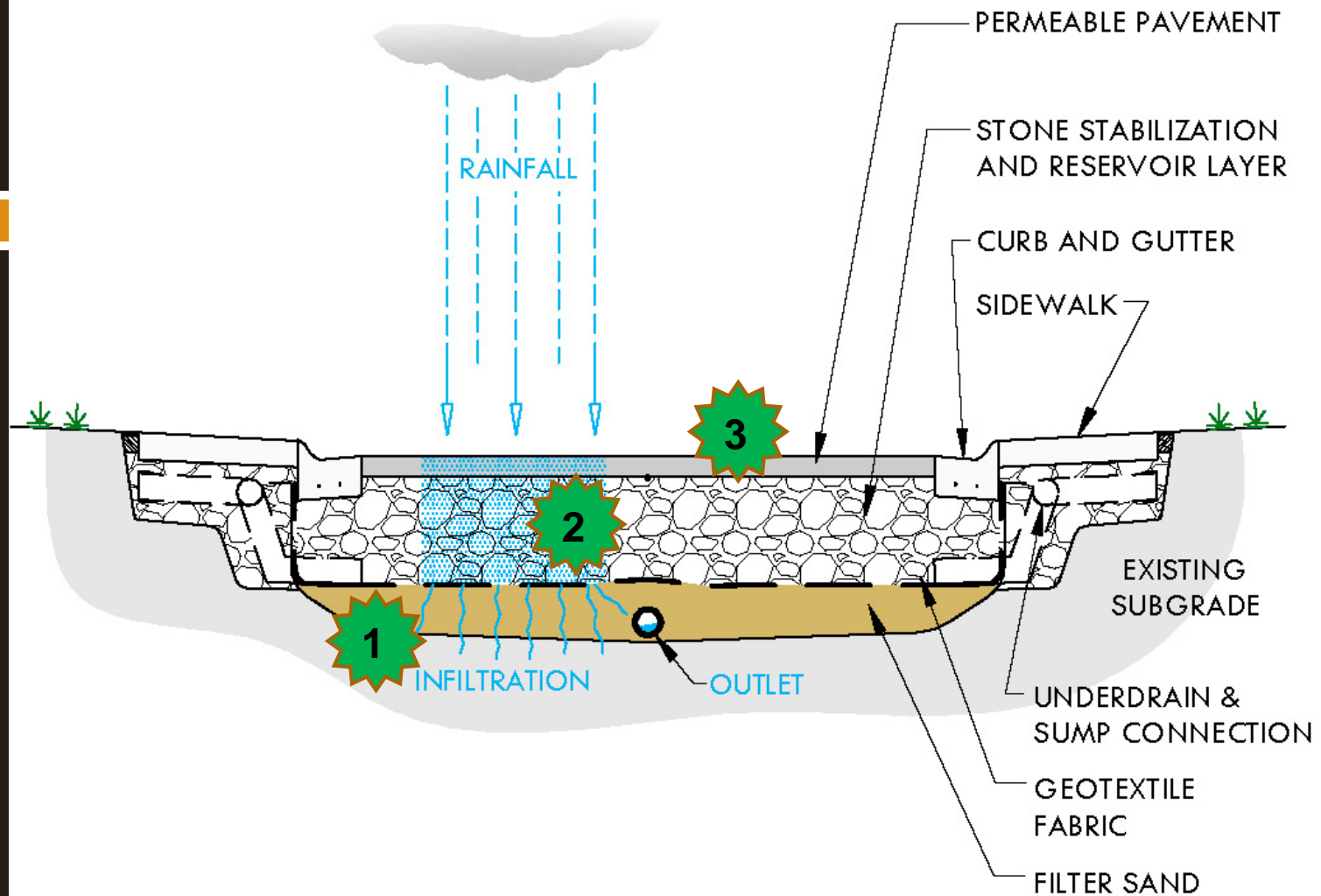
- ❑ *Flat road*
- ❑ *Narrow road*
- ❑ *Narrow ROW*
- ❑ *Ponding*



# Sylvan Ave - Design

- Initial soil borings
- Deeper soil borings
- To infiltrate or not to infiltrate?

Sample No./Type	Recovery (in.)	Depth (ft.)	Description of Material
		0	Ground Surface Elevation =
			Note 1
			Note 2
SS-1	18	1	SILTY FINE TO MEDIUM SAND FILL - trace clay and gravel - loose - moist - brown - (SM)
		2	
		3	
SS-2	18	4	Note 1: 2.0" Bituminous Concrete Pavement
		5	
		6	
		7	Note 2: 6.0" SILTY FINE TO COARSE SAND AND GRAVEL FILL - moist - brown - (SM-GM Fill)



SYLVAN AVENUE CROSS SECTION

# Sylvan Ave - Design

## 1. Filter Layer

- Free draining sand
- 6" Underdrain
- Impermeable liner

## 2. Reservoir

- *100 yr design storm*
- *18-24" thickness (35-40% voids)*
- *Open graded stone*



# Sylvan Ave - Design

## 3. Pavement section & details

- Permeable HMA
  - 3" thick
  - 50 gyratory mix design
  - 75-85% density; 15-25% porosity
  - AC 5.0-6.5%
  - Polymer Binder
- Standard curb & gutter vs. spill-out

# Sylvan Ave - Design

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# Sylvan Ave - Construction

- Subgrade prep



# Sylvan Ave - Construction

- Membrane & underdrains





# Sylvan Ave - Construction

■ Aggregate





# Sylvan Ave - Construction

- Curb & gutter and sidewalk



# Sylvan Ave - Construction





# Sylvan Ave - Construction





# Sylvan Ave - Construction

- Permeability Test ("bucket test")



# Agenda

- Benefits
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# Willard St. - Background

## 1. Different Challenges

- Soils
- Cross Slope
- Traffic Volumes

## 2. Different Opportunities

- *Full Infiltration*
- *Spill-Out Curbs*

# Willard St. - Design

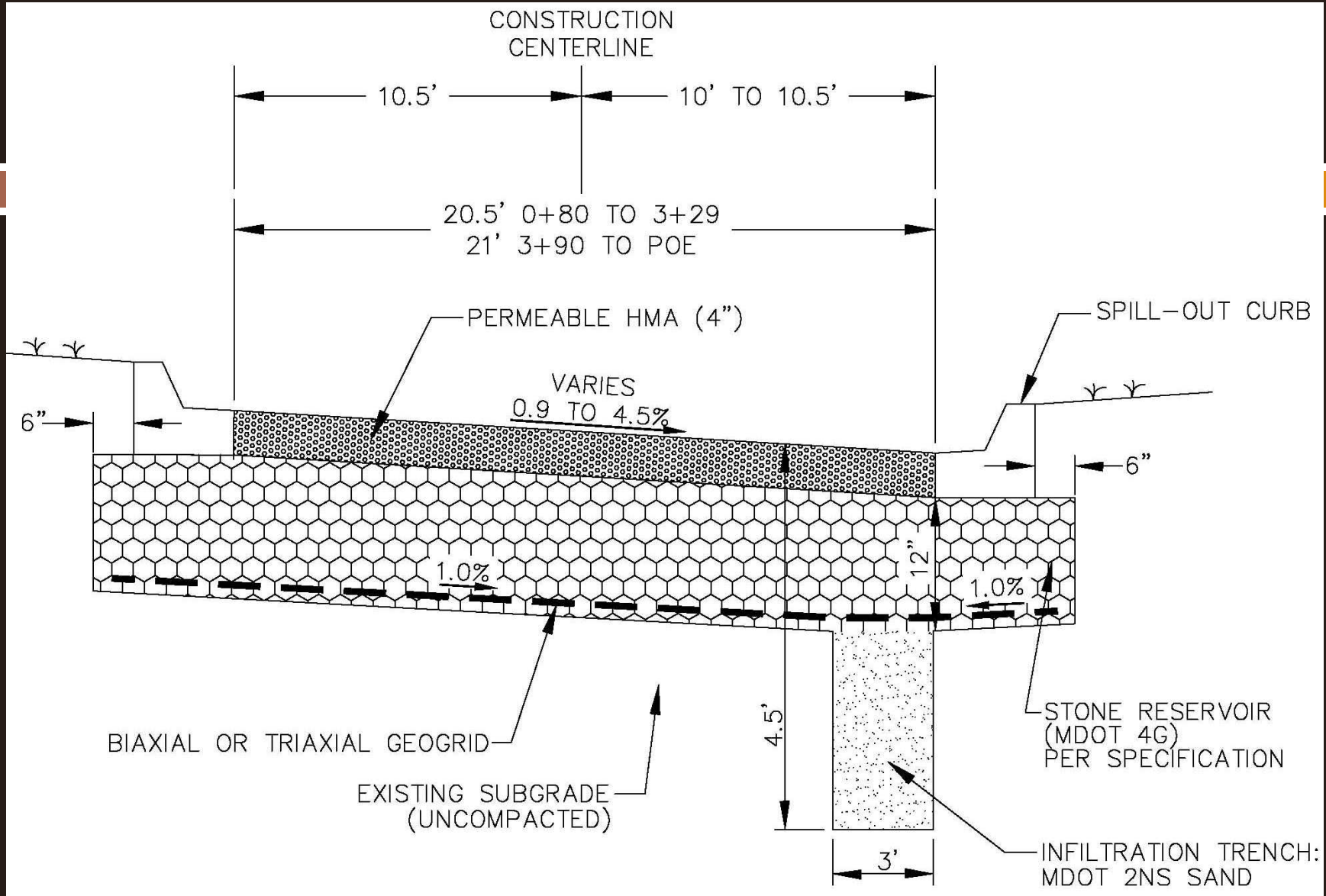
## 1. Stone Reservoir

- *Used different aggregate*
- *Minimum 30% voids*
- *Grid, but no liner*

## 2. HMA mix

- 4" thickness





# Willard St. - Construction





# Willard St. - Construction



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# Maintenance - General

**Vacuum Road** - twice per year  
(Fall and Spring)

**Clogged Areas** - Power wash  
( $< 200$  psi) with detergent, and  
vacuumed.



# Maintenance - General

Exposed Ground - Seed and mulch

Stock Piling Materials - Not permitted

Surface Sealing or Resurfacing - Not permitted

Patching (< 50 square feet) - Standard patch

Patching (> 50 square feet) – Permeable pavement

# Maintenance - Winter

**Plowing** – Plow every 2" + storm with a slightly raised blade

**Salt** – Minimal salt permitted

**Sand** – Not permitted

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# Performance Analysis

- Evaluating Permeability over time
  - Custom designed device
- Two years of data now in hand

# Performance Analysis

Street	Infiltration 2013	Infiltration 2014 before sweeping	infiltration 2014 after sweeping	
Sylvan (2010)	0.25	1.00	0.42	in/min
Wells Alley (2011)	7.27	0.87	0.88	in/min
Willard (2012)	6.13	0.27	0.30	in/min
Fuller Lot	24.40	22.41		in/min

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# Alternatives

- Infiltration without permeable pavement?
  - Conventional HMA surface
  - Open graded stone reservoir
  - Storm inlets to connect
- Forest & Fourth Ave in 2013

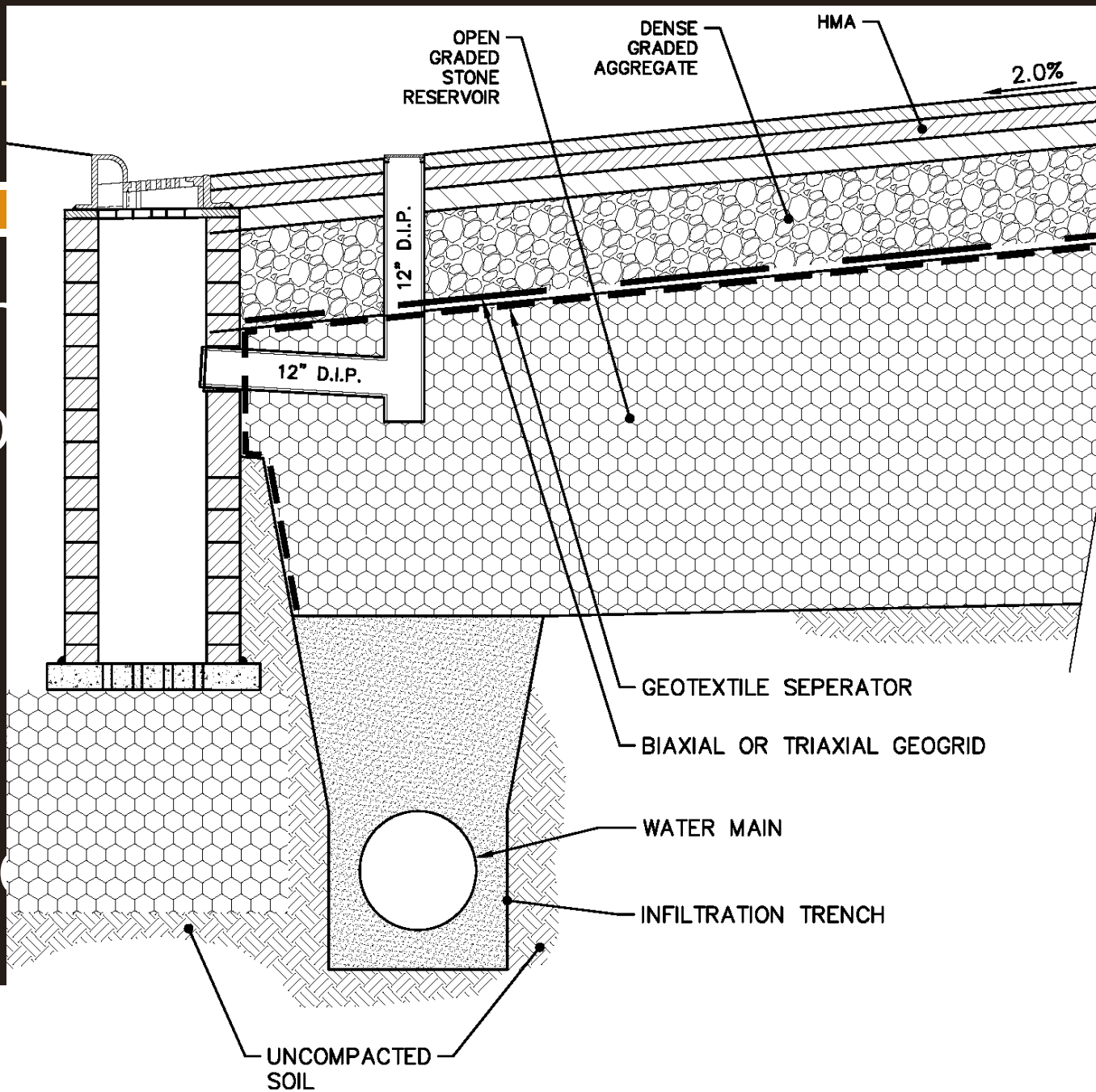


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# Questions?



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